THE additions to the Zoological Society's Gardens during the past week include a Guinea Baboon (*Cynocephalus sphinx*) from West Africa, presented by Captain C. C. Wyatt; three Common Marmosets (*Hapale jacchus*) from South-east Brazil, presented by Colonel A. H. Maclean; two White-tailed Gnus (*Connochœtes gnu*, ♂ ♀) from South Africa, presented by Mr. C. D. Rudd; a Cape Zorilla (*Ictonyx zorilla*), a Little Ichneumon (*Helogale parvula*), a Spotted Eagle Owl (*Bubo maculosus*) from South Africa, presented by Mr. J. E. Matcham; two South African Kestrels (*Tinnunculus rupicolus*) from South Africa, presented by Mr. C. Southy; a Naked-footed Owlet (*Athene noctua*), European, presented by the Hon. Mrs. Barrington; two Senegal Parrots (*Pœocephalus senegalus*) from West Africa, presented by Miss E. L. Barford; four Fieldfares (*Turdus pilaris*), a Black Guillemot (*Uria grylle*) from Christiansund, North Norway, presented by Dr. R. B. Sharp; an Indian Python (*Python molurus*) from India, presented by Mr. Percival F. Tuckett; a Four-lined Snake (*Coluber quatorlineatus*), European, presented by Mr. J. W. Temple; twelve Algerian Skinks (*Eumeces algeriensis*) from Algeria, presented by Mr. Robert S. Hunter; a Malabar Squirrel (*Sciurus maximus*, var. *dealbatus*) from India, two Forster's Ceratodus (*Ceratodus forsteri*) from Australia, deposited; a Crowned Partridge (*Rollolus cristatus*) from Malacca, four Common Cormorants (*Phalacrocorax carbo*) from Holland, two Cereopsis Geese (*Cereopsis novæ-hollandiæ*), two Forster's Ceratodus (*Ceratodus forsteri*) from Australia, purchased; three Triangular-spotted Pigeons (*Columba maculosa*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMETS NOW VISIBLE.—Last week it was noted in these columns that Mr. Coddington had discovered a comet in the position R.A. 16h. 24m. 45·9s., and Declination (South) 25° 14′ 20″. Circular (No. 7) of the *Centralstelle* gives the elements and ephemeris of the comet, based on the positions observed on June 11, 13 and 15, and calculated by Prof. A. Berberich. The former are as follows:—

T = 1898 August 4·478 Berlin M.T.

$$\left.\begin{aligned} \omega &= 206^\circ\ 8'{\cdot}5 \\ \Omega &= 73\ \ 58{\cdot}7 \\ i &= 76\ \ 48{\cdot}3 \end{aligned}\right\} 1898{\cdot}0$$

$$\log q = 0{\cdot}31850$$

As the comet is moving rapidly south, and has now a Declination (South) of about 32°, we do not give the ephemeris. This comet was independently discovered by Dr. W. Pauly in Bucharest on June 14.

We have received two telegrams from Kiel concerning another comet, Perrine (June 14). The former gives the observation made on June 14 at Lick mean time 15h. 16·0m., giving the position Right Ascension 3h. 29m. and Declination + 58° 36′, the latter showing the position to be Right Ascension 3h. 34m. 58s. and Declination + 58° 24′ 2″ at Lick mean time 14h. 12m. on June 15. A Circular (No. 5) from the *Centralstelle* gives us the elements and ephemeris calculated by Perrine and Aitken from the observations made on June 14, 15 and 16. These are:—

Elements.

T = 1898 August 17·40 Greenwich M.T.

$$\left.\begin{aligned} \omega &= 196^\circ\ 46' \\ \Omega &= 260\ \ \ 6 \\ i &= 69\ \ 42 \end{aligned}\right\} 1898{\cdot}0$$

$$q = 0{\cdot}7418$$

Ephemeris for 12h. Greeenwich M.T.

1898.		R.A. h. m. s.		Decl. ° ′		Br.
June 20	...	4 2 52	...	+57 15	...	1·18
24	...	4 25 24	...	55 56		
28	...	4 48 48	...	54 20		
July 2	...	5 10 0	...	+52 27	...	1·72

The comet will thus gradually brighten as July is approached, but takes a somewhat southerly course.

Another Kiel telegram, dated June 18, tells us that Perrine found Wolf's comet on June 16, at 15h. 5·3m. Lick mean time, in position—

R.A. 2h. 16m. 19s., and Declination + 19° 42′ 44″.

Still another and last telegram from Kiel, dated June 19, informs that comet Giacobini was seen on June 18 at 13h. Nice mean time in the position of Right Ascension 20h. 36m. 30s. and Declination − 21° 14′ 0″.

THE 40-INCH YERKES REFRACTOR.—Prof. Barnard, writing in the *Astronomical Journal* (No. 436) with respect to a series of measures of the satellite of Neptune, gives an interesting account of the behaviour of the Yerkes telescope. Actual observation was not possible until the best season was essentially over, but it was found that even a part of this unfavourable weather permitted the power of the telescope to be tested. On one or two occasions, when observing double stars, he was able to use powers of several thousand diameters, and on one date he employed a power of 3750 with good success. The object-glass he finds entirely free from any form of ghost, and the definition is at times very good, showing, as he says, that "this last great work of Alvan Clark is one of his noblest monuments." The driving clock moves the great tube with such perfect steadiness that he was astonished at the result, and so stable is the mounting of the instrument that the effect of the clock, rewinding itself automatically at periods of 1h. 48m., does not in the least interfere with micrometer work. Very satisfactory also are the electrical contrivances at the eye end for clamping and slow motion; the clock takes up the tube upon the application of the electric clamp in Right Ascension perfectly instantaneously, and the slow movement is so exact that a star can be brought from the edge of the field and stopped instantly behind the micrometer-wire, the motion being about 1′ in 8 seconds. Prof. Barnard further mentions the ease with which the instrument can be handled; as an instance, he says that he placed the telescope on the west side of the pier in position of + 50° declination, and by means of the electric motors he moved it on the other side of the pier to the same Declination in 1m. 50s. An important addition to the dome is the wind-break. This consists of two curtains working on endless chains, one rising from the base of the slit, and the other passing through the zenith from the rear. With these, excepting at low altitudes and right in the face of the wind, the tube is always perfectly protected even on the windiest nights.

VARIABLE STARS OF SHORT PERIOD.—Prof. E. C. Pickering describes in a *Harvard College Observatory Circular* (No. 29) a very simple means of detecting variables whose periods are short if the observer is provided with a telescope mounted equatorially and a fairly good driving clock. The method is so simple and complete that it has probably been tried before, although, so far as we know, no mention of it has come under our notice. The idea is to expose a photographic plate in a telescope, the clock of which is working somewhat fast, and at intervals of ten and fifty minutes to alternately expose and cover the lens by an electrical attachment. Prof. Pickering describes one of the plates so exposed. An 8 × 10 plate was exposed in a telescope with a Cooke anastigmatic lens, aperture 2·6 cm. and focal length 33·3 cm. and eight successive images of each star were obtained in the period of about eight hours. The plate covered a region of about 33° square, and a portion of it, shown in the *Circular*, indicates the variable intensity of the images of the star U Cephei, while those of the neighbouring stars show no such variations.

On this scale forty plates would cover the whole sky from north to south pole, and Prof. Pickering proposes to undertake this work as soon as the best method of taking the plates has been determined. By the above plan it is hoped to secure a complete list of all variable stars of short period brighter than the ninth magnitude at maximum, whose variation exceeds half a magnitude, and whose period is less than a day. In such a sweep, probably, many other variable stars of longer period, and stars of the Algol type will be discovered.

The beauty of the above method lies in the simple equipment that is necessary to obtain results of considerable value. It will be noticed that the method is a differential one, clouds passing across the field of view during an exposure affecting all the photographic images alike.

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THE OXFORD UNIVERSITY OBSERVATORY.—The twenty-third annual report of the visitors of the University Observatory appears in a recent number (June 14) of the *Oxford University Gazette.* The report refers to the period from June 1, 1897, to May 31, 1898, and exhibits the state of the observatory on the last-named day. One of the main points referred to by Prof. Turner in the report, is that of the necessity of completing the observatory by attaching to it a residence. This, he points out, is urgent, since it is most imperative that the official staff should be as near their work as possible when both routine observational work and students have to be dealt with. Prof. Turner refers to a very curious accident that occurred to the level belonging to the Barclay transit circle that is used for time determinations, which is well worth repeating. "The striding level, weighing 19 lbs., which was suspended over the instrument by means of a cord, pulley and counterpoise, fell (from its usual position when not in use near the roof) a distance of three or four feet on to the instrument, owing to the snapping of the cord. It was found the next morning standing upright, with its feet on the pivot covers as if in position for an observation. The blow had thus been received by the pivot covers, and no other part of the instrument had apparently been damaged or even struck. The brass tube of the level itself was shattered, but the glass-tube inside was not broken!" Surely this is quite a unique accident?

The measurement and reduction of the plates for the Astrographic Catalogue seem to be proceeding apace, an average of 3951 measures of the star positions and magnitudes being made every week, the total number for the year being 205,443. The main result of the year's work is that the prospects of achieving the object aimed at are brighter than previously: this was, as Prof. Turner states, that by the middle of 1901 we may be ready to furnish, or demand, the positions and magnitudes of the brighter stars in zones + 24° to + 32° to the number of something like a quarter of a million. The speed at which these measures can be made, can be gathered from the statement that "whereas at first thirty or forty star-measures an hour was thought fair work, the more skilful can now measure 150 per hour or more." The new photographic transit circle has involved much experimental work, and is proceeding satisfactorily.

THE SUPPOSED VARIABLE Y AQUILÆ.—In the series of measures to determine the light curves of variable stars of short period north of − 40° Declination with the meridian photometer, the curve of the star + 10° 3787 was not found to be smooth. This star had previously been catalogued by Chandler as varying from 5·3 to 5·7 in a period of 4·986 days. It was also suspected by Gould, confirmed by Chandler 1894, and also by Yendell. Mr. Wendell has recently made some observations (*Harvard College Observatory Circular*, No. 30) with the photometer attached to the 15-inch equatorial telescope, on six nights in May last, eighty sittings being made each night, the comparison star employed being + 10° 3784. The mean of the differences of magnitude showed very little variation, and, as Prof. Pickering states, fails to show any evidence of variation, since deviations of a tenth of a magnitude may be ascribed to errors of observation. Since it is "impossible to prove that the light of a star never changes, this star may still be an Algol variable with a short time of variation, or the period may be entirely wrong."

COMPANIONS OF ARGON.[1]

FOR many months past we have been engaged in preparing a large quantity of argon from atmospheric air by absorbing the oxygen with red-hot copper, and the nitrogen with magnesium. The amount we have at our disposal is some 18 litres. It will be remembered that one of us, in conjunction with Dr. Norman Collie, attempted to separate argon into light and heavy portions by means of diffusion, and, although there was a slight difference[2] in density between the light and the heavy portions, yet we thought the difference too slight to warrant the conclusion that argon is a composite substance. But our experience with helium taught us that it is a matter of the greatest difficulty to separate a very small portion of a heavy gas from a large admixture of a light gas; and it therefore appeared advisable to re-investigate argon, with the view of ascertaining whether it is indeed complex.

In the meantime, Dr. Hampson had placed at our disposal his resources for preparing large quantities of liquid air, and it was a simple matter to liquefy the argon which we had obtained by causing the liquid air to boil under reduced pressure. By means of a two-way stopcock the argon was allowed to enter a small bulb, cooled by liquid air, after passing through purifying reagents. The two-way stopcock was connected with mercury gas-holders, as well as with a Töpler pump, by means of which any part of the apparatus could be thoroughly exhausted. The argon separated as a liquid, but at the same time a considerable quantity of solid was observed to separate, partially round the sides of the tube, and partially below the surface of the liquid. After about 13 or 14 litres of the argon had been condensed, the stopcock was closed, and the temperature was kept low for some minutes in order to establish a condition of equilibrium between the liquid and vapour. In the meantime the connecting tubes were exhausted, and two fractions of gas were taken off by lowering the mercury reservoirs, each fraction consisting of about 50 or 60 cubic cm. These fractions should contain the light gas. In a previous experiment of the same kind a small fraction of the light gas had been separated, and was found to have the density 17·2. The pressure of the air was now allowed to rise, and the argon distilled away into a separate gas-holder. The white solid which had condensed in the upper portion of the bulb did not appear to evaporate quickly, and that portion which had separated in the liquid did not perceptibly diminish in amount. Towards the end, when almost all the air had boiled away, the last portions of the liquid evaporated slowly, and when the remaining liquid was only sufficient to cover the solid, the bulb was placed in connection with the Töpler pump, and the exhaustion continued until the liquid had entirely disappeared. Only the solid now remained, and the pressure of the gas in the apparatus was only a few millimetres. The bulb was now placed in connection with mercury gas-holders, and the reservoirs were lowered. The solid volatilised very slowly, and was collected in two fractions, each of about 70 or 80 cubic cm. Before the second fraction had been taken off, the air had entirely volatilised, and the jacketing tube had been removed. After about a minute, on removing the coating of snow with the finger, the solid was seen to melt, and volatilise into the gas-holder.

The first fraction of gas was mixed with oxygen, and sparked over soda. After removal of the oxygen with phosphorus it was introduced into a vacuum-tube, and the spectrum examined. It was characterised by a number of bright red lines, among which one was particularly brilliant, and a brilliant yellow line, while the green and the blue lines were numerous, but comparatively inconspicuous. The wave-length of the yellow line, measured by Mr. Baly, was 5849·6, with a second-order grating spectrum. It is, therefore, not identical with those of sodium, helium, or krypton, all of which equal it in intensity. The wave-lengths of these lines are as follows:—

Na (D_1)	5895·0
Na (D_2)	5889·0
He (D_3)	5875·9
Kr (D_4)	5866·5
Ne (D_5)	5849·6

The density of this gas, which we propose to name "neon" (new), was next determined. A bulb of 32·35 cubic cm. capacity was filled with this sample of neon at 612·4 mm. pressure, and at a temperature of 19·92° it weighed 0·03184 gram.

Density of neon ... ... 14·67

This number approaches to what we had hoped to obtain. In order to bring neon into its position in the periodic table, a density of 10 or 11 is required. Assuming the density of argon to be 20, and that of pure neon 10, the sample contains 53·3 per cent. of the new gas. If the density of neon be taken as 11, there is 59·2 per cent. present in the sample. The fact that the density has decreased from 17·2 to 14·7 shows that there is a considerable likelihood that the gas can be further purified by fractionation.[1]

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[1] "On the Companions of Argon." By William Ramsay, F.R.S., and Morris W. Travers. Paper read at the Royal Society, June 16.

[2] Density of lighter portion, 19·93; of heavier portion, 20·01 (Roy. Soc. *Proc.*, vol. 60, p. 206).

[1] June 21.—After a preliminary fractionation, the density has been still further reduced to 13·7.

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